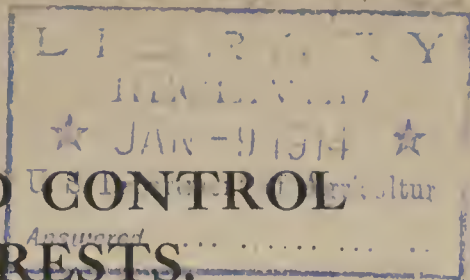


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# FIRE PREVENTION AND CONTROL ON NATIONAL FORESTS.

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The revenue from the manufacture of timber benefits directly, or indirectly, every channel of trade, every industry and every individual in the State; therefore it is obvious that the destruction of timber by fire is a loss in the same ratio to every man, woman and child. Furthermore, the great timber resource, unlike many other natural sources of wealth, need not be exhausted through use, but can be made to perpetuate itself for man's benefit. Where it has not been allowed to reproduce itself, the chief agency of forest destruction has been fire.

The disastrous forest fires of the past few years have startled the entire western country and have stirred the public to **Favorable** action. The people are aroused after a long period of **Public** apathy and have organized and are still organizing as- **Sentiment.** sociations for fire control. They have demanded action from Legislatures, and as a result, efficient State agencies have been built up with adequate appropriations to carry out the provisions of fire laws. The alarm which has been sounded has been far-reaching in its effect. In addition to getting the private citizen interested, the Federal Departments of Justice, Agriculture, Interior and Post Office have taken steps to co-operate in saving the National Forest wealth from destruction.

The National Forest officers have long been engaged in fire pre- **Forest** vention and control, even where local opinion did not **Officers** support their efforts. They are charged with the **Responsible.** great responsibility of saving hundreds of thousands of dollars worth of perishable property from destruction. The Forest officer is the representative of the Government in his district, and has a heavy responsibility.

## PATROL.

Patrol is a means of control and consists in traveling over a certain designated area or district, by saddle horse, buggy, **Patrol** motor boat, motorcycle, car, or on foot. **Defined.** It is necessary to know the daily happenings to have full control of a district upon a National Forest. In patrol, as in every other feature of National Forest work, success

or failure is largely due to good or bad judgment. Good judgment is the Forest officer's greatest asset.

To insure effective work, patrol must be systematized to meet the peculiar and local conditions of each sub-district. These conditions are directly attributable to topography, accessibility to roads and trails, streams, aspect and slope. litter or ground cover, forest composition, permanent lookout stations, resorts, public camping places, and hunting grounds.

Patrol requires both intimate knowledge of and familiarity with the district to determine best methods. The officer must be guided by the existing conditions in dividing his time between riding over trails and roads through territory frequented by campers, and on high ridges and lookout points for observation purposes. It is extremely important that he should make occasional, but irregular visits to every camp in his district. It will not only afford him an opportunity to study and learn the names, habits, plans, and movements of the campers, hunters, and others, but the presence of an officer naturally makes the campers more careful.

The prevention of fires is, of course, first in importance. Nevertheless, fires do occur, and when they do, it is imperative to know of them as soon as possible and to get action while they are yet small and easily suppressed.

The easiest and probably the quickest way of getting this information is usually by daily or frequent visits to lookout points from which a view of a whole or part of a district may be had. Care should be taken not to leave an observation point until it is absolutely certain that there are no fires. Very often it takes considerable time to discover and locate a small fire.

Usually the best time to visit a lookout point is from noon to 3 p. m.; then the fires have started up and the smoke is visible long distances. In extreme hazy or smoky weather where observation points can not be relied upon, the officer must adopt other means of discovering fires. This may mean increased labor and double patrol; it means, in particular, the fullest co-operation with the public, especially settlers, ranchers, stockmen, prospectors, and others.

Successful dealing with the public goes a long way in keeping down fires. Most of the campers and hunters who visit the mountains during July, August and September are prominent, law-abiding citizens. While many are experienced campers, others have little or no knowledge of the woods. Usually there is no trouble with the experienced camper, if he is a good citizen, for he is careful with his fires. The fellow who does not know how must be assisted and the incendiary must be watched. Care must be taken, however, not to class the good citizen with the bad one; to avoid this requires good judgment, tact, and politeness.

It must be kept in mind first and last that persons are encouraged to go upon and make use of the National Forests; in visiting camps, an officer should never allow his attitude to show or indicate that he is there for the purpose of watching the campers or that he suspects them, except in extreme and justifiable cases. Visits of this kind should be friendly, not officious. The camper should be made to feel that the Service wants to help him and not to harass him. Even though he may be suspected, the suspicion must not be shown, unless it is amply supported by facts, because there is always room for mistakes.

It is neither necessary nor wise to warn all persons to be careful with their fires. Here again, tact and judgment must be exercised, to know where to draw the line. When it is plainly noticeable that campers are taking extra precaution with their fires and are neat around camp, as in many cases, they should be commended, without being patronized. It is far from beneficial and effective to warn persons to be careful when they *are* already careful. When it is necessary, as it is many times, to caution campers, do it courteously, as a suggestion rather than a demand. It will get better results, unless the case is a downright wilful one, in which event, evidence should be secured and laid before the County or District Attorney, who is responsible for taking such measures as will prevent a recurrence. A complaint containing a specific charge of the offense should be filed.

In the administration of a district many of the details must be left to the officer on the ground. He is the only one who can deal with the ever-changing local conditions and the new matters constantly arising. The following suggestions may, however, be of material aid, especially to the new man:



Keep all roads and trails open and all telephone lines in repair. Daily tests of telephones are imperative.

Keep in good condition and have a close check of all tools, cooking utensils and provisions at tool stations; it may save delay in case of fire.

**Suggestions to New Men.** Keep all ranger station pasture fences in repair—it will protect the Forest Service pasture from outside stock and will enable the Service to leave horses there while fighting fire.

Officers should keep themselves informed as to the location and movements of all construction crews, survey, and reconnaissance parties, and pack trains. These are mentioned later in the fire plan.

A complete list of equipment should be made by each officer early in the season and a copy sent to the supervisor to be incorporated in the fire plan at the time of its annual revision. This report should show the number and condition of each class of equipment, and if the equipment is adequate. If inadequate, the officer should report that fact to the Supervisor. Care should be taken to have all tools sharpened and in first-class condition before the beginning of the fire season.

**Annual Inventory of Equipment.**

If the officer is not fully familiar with his district, he should familiarize himself with the location and importance of all trails, tool stations, lookout points, principal camping grounds and hazard areas, before the actual patrol season opens.

**Learning the District.**

In order to co-operate intelligently and effectively, an officer should become personally acquainted as soon as possible with the patrolmen in adjoining districts, their post office addresses, where they can be reached by telephone and their system of patrol, as provided in the detailed fire plan. This includes districts outside of the Forest patrolled by Federal, State, and fire association men.

**Co-operation With Patrol Men in Adjoining Districts.**

## HANDLING FOREST FIRES.

The successful handling and suppression of forest fires is a science, involving extraordinary ability, which comprises good judgment, experience, system, thorough knowledge of all strategic features, decision, resourcefulness, and executive leadership.

**Science of Fire Suppression.**

Preparation is the first essential of forest protection; one must be ready to grapple with any kind of a fire understandingly and effectively without delay. The responsibility of preparation and execution centers around the district ranger. He is the nucleus of fighting force; his thorough knowledge of his district, of available men to hire, of location of tools and provisions, best and quickest methods of transporting them to fires, of strategic points of attack and suitable camping places, are important factors of preparation.

There are several kinds of forest fires, the control of which requires different methods. Classes of fires are determined by such factors as size, amount and condition of inflammable material on the ground, velocity of the wind, topography, forest type and cover.

Because of the varying conditions and daily changes of temperature, humidity, winds and calms, and of the different types of combustible materials in a forest, it will be necessary to group fires under classes before a definite and detailed plan of attack can be outlined. From the point of view of attack there are at least five classes of fires, which are easily identified and must be recognized before they can be successfully fought.

### CLASSES OF FIRES.

*First:* Neglected camp or other small fires (covering from a few feet square to several rods), which can be extinguished by direct attack.

*Second:* Ground fires, which burn in deep humus, in dense timber or old decayed logs, which usually burn slowly for weeks and sometimes months, and are difficult to extinguish entirely.

*Third:* Small, slow burning surface or ground fires consuming leaves, grass and other scattering inflammable material, covering an area of  $\frac{1}{4}$  to 5 acres, where direct attack may or may not be advisable.

*Fourth:* A very hot and rapid-burning fire running in a heavy mass of combustible debris on the ground in an old burn or scattering timber, with an occasional crown fire of a few minutes' duration, where direct attack is impossible, having a fire front of from  $\frac{1}{8}$  to 1 mile.

*Fifth:* Crown fires or conflagration; where, on account of swift-

ness and intensity of heat, human efforts must have the assistance of natural means before suppression is possible.

Since fires, under favorable conditions, are very apt to develop from one class to another, the man in charge must be on the alert and not hesitate to change his method of fighting to meet changing conditions.

**Suit Method to Class.**

### DISCOVERY OF A FIRE.

When a fire is discovered, the important thing is to get *effective action* on it with the least possible delay. Take time to study its location, probable size, cause and velocity and direction of the wind. If an officer is unfamiliar with the exact location, observe and take note of any peculiar landmarks that can be easily identified later in reference to the location of the fire. Be careful not to be deceived in the size or location, for smoke usually drifts up a canyon and often makes a fire look, at a distance, much larger than it really is.

If it is concluded that the fire is not within the district over which the officer has charge, he should then determine in whose district it is, and whether it is in the National Forest. If there is telephone connection with the ranger in whose district the fire is located, it will not be necessary to go to the fire, unless he needs help and the local district has no fires. If he can not be reached by telephone, and the distance is not unreasonable, the officer who discovers it should treat it as his fire until relieved by the ranger in whose district it is located. If the distance is unreasonable, get word to the supervisor. An "unreasonable" distance is greater in some places than in others. In some places, twenty-five or thirty miles would be unreasonable, while in others fifty miles would be a very reasonable distance. It depends upon accessibility, whether in a settlement or in an isolated territory. The officer on the ground must determine largely for himself what would be a reasonable or unreasonable distance to go to a fire. Here again, is a test for judgment.

If the fire is outside, but threatening the Forest, the Forest officer should try to get the State, railroad, or fire association warden, or other man patrolling that District. If he can not be gotten, the fire should be treated as local until relief comes, or until the fire is out. If the outside warden arrives, he should be given all possible assistance.

**Co-operation When Outside Fire Threatens.**



If the fire is outside and not threatening the Forest, word should be gotten to the State Warden or other patrolman in that district and also report it to the Supervisor, if possible. These men are cooperating and are instructed to do the same thing for the Forest Service; if they do not cooperate, the Supervisor is to be notified.

With the fire in an officer's district, the whole thing is up to him. He should take a man with him, if he has one, unless the fire is very small, where one man can easily handle it alone. Except in unusual cases, it is best to examine a fire pretty thoroughly before rushing after men. By this, it is not meant that unnecessary time should be wasted in examination before going after help, but it is not good business or good judgment to jump at conclusions without some knowledge of what one is doing; to rush in a large number of men and supplies, when, by a little more careful examination, a much smaller number would have been sufficient is rash and expensive. Fires, at the time of burning, are usually exaggerated; especially is this true if discovered or examined in the afternoon, at which time a fire is at its worst, and a man, if he isn't careful, will over-estimate its seriousness and get more men than are needed. It is, on the other hand, even more serious to under-estimate the number of men needed.

After the needed number of men has been determined, the assistant, if there is one, should go around the front of the fire, find out where the head of it is, what it is likely to get into, and should look for suitable camp grounds for the men, and for the best points of attack. Men and supplies must be gone after by the officer himself, unless they can be sent in by the Supervisor, or some other experienced man. Getting men and supplies and packers and getting them to the fire at the earliest possible moment, is the chief business and most important part of the first stages of a fire transaction. One can't afford to depend upon every "Tom, Dick, and Harry," to secure men, tools, and supplies, and expect them to get to the fire on time. It takes personal supervision and untiring energy to do this right. Organization is essential and by the time a crew reaches a fire the men should be arranged into crews of from 6 to 10 men each, depending upon the character of labor you have to deal with, and a subforeman should be in charge of each crew.

The district ranger, who is the administrative officer of his district, should have full jurisdiction of all important fires. When a

forest guard or other patrolman discovers a fire that is beyond his control, he should report it at once to the district ranger, who will take charge of it.

As a matter of protection, it is imperative that patrol should be maintained, even though there are one or more fires burning in a district.

In order to save valuable time in determining the proper kind and number of tools and equipment needed and also the amount and kind of provisions, Tables 1, 2 and 3 have been prepared. A study of these tables will enable one in a few moments' time to make out an order for tools, cooking utensils, and provisions, for any number of men and days. You may be even more forehanded and place standard orders for supplies in the hands of local merchants. These orders should be for crews of varying sizes and may be identified by giving each a number.

### EMPLOYING FIRE FIGHTERS.

In employing transient men to fight fire, one has to depend largely on his judgment and on the physique and general appearance of the men. If a man has an emaciated look, soft or cigarette-colored hands, he should not be hired. He will not be able to give service. If he is wearing shoes and other clothing unsuitable for rough work such as fire fighting would be, even though he has a good physique, he should not be hired, unless he can be provided with suitable clothing and blankets. One can often determine whether a man is accustomed to hard work by the condition of his hands; whether his flesh is hard or flabby. It is well to ask such questions as: "Have you been employed recently at hard work? At what, where, and for whom? What is your trade or profession? Do you use tobacco? If so, have you enough for ten days?" If one is led to believe that the fellow is misrepresenting himself, there should be caution about hiring him.

It is well to pick the very best men for fire fighters—men who have the appearance of being able to undergo hardships. A poor man fighting fire is only a dead expense to the Government; therefore, great care should be exercised in securing men for that work.

In examining men for this work, it is well to keep in mind men who would be suitable for "straw bosses" (subforeman) in the event that they would be needed.

## EQUIPMENT.

	Men	Shovels	Axes	Mattocks	Cross-cut Saws	Setts Hoes	Picks	Brush Hooks	2 ½ Gal. Water Bags	5 Gal. Water Bags	8-inch Files	Carb. Stone	Crab. Tool Grinder	Peavies	Sledge	Wedges	Torch	Total Weight	Total Weights from all Tables	Pack horses
1	1	1	1			1			1		1	1						12	63	1
2	2	2	1			1			2		3	3						18	76	1
3	3	3	2		1	1			2		4	4						38	102	1
4	3	3	2		1	1			2		6	5						39	142	1
5	4	3	3	1	1	2			1	1	12	6			1	1	1	72	220	2
6	4	4	3	1	1	2			1	1	12	7			1	1	1	77	261	2
7	5	3	3	3	1	2			2	1	12	8			1	1	1	84	283	2
8	6	4	4	2	1	2			2	1	12	9			1	1	1	97	457	3
9	7	4	4	2	1	2			2	1	12	9			1	1	1	115	485	3
10	8	5	5	2	2	3	1	1	3	1	12	10	1	1	1	1	1	191	612	4
11	9	6	6	3	2	3	2	1	4	1	12	11	1	1	2	2	1	220	645	4
12	10	6	6	3	2	4	2	2	4	1	18	12	1	1	2	2	1	234	668	4
13	10	6	6	3	2	4	2	2	4	1	18	13	1	1	2	2	1	235	675	5
14	11	7	7	3	2	4	2	2	5	1	18	14	1	1	2	2	1	242	696	5
15	12	7	3	3	3	4	2	3	5	2	18	15	1	1	2	2	1	242	703	5
16	13	8	3	3	3	4	2	3	5	2	18	16	1	1	2	2	1	254	743	5
17	14	8	4	3	4	5	2	3	5	2	18	17	1	2	2	2	1	261	759	6
18	15	8	4	3	5	5	2	3	6	2	24	18	1	2	2	2	1	270	800	6
19	16	9	4	3	5	5	2	3	6	2	24	19	1	2	2	2	1	282	837	6
20	16	9	4	3	5	5	2	3	7	2	24	20	1	2	2	2	1	289	852	6
21	17	10	4	3	5	5	3	3	7	2	24	21	1	2	2	2	2	308	877	6
22	17	10	5	3	5	5	3	3	8	2	24	22	1	2	2	2	2	315	890	6
23	18	11	5	3	5	5	3	3	8	2	30	23	1	2	2	2	2	330	910	6
24	19	11	5	3	5	5	3	3	9	2	30	24	1	2	2	2	2	347	934	7
25	20	12	5	3	5	5	3	3	9	2	30	25	1	2	2	2	2	392	995	7
26	20	12	5	3	5	5	3	3	9	2	36	26	1	2	2	2	2	393	1002	7
27	21	13	6	3	5	5	3	3	10	2	36	27	1	2	2	2	2	411	1025	7
28	21	13	6	3	5	5	3	4	10	2	36	28	1	2	2	2	2	412	1032	7
29	22	13	6	3	5	5	3	4	10	2	36	29	1	2	2	2	2	418	1043	7
30	23	13	6	3	5	5	3	4	10	2	36	30	1	2	2	2	2	425	1056	7

## MEDICINE KIT.

The Supervisor should obtain for each ranger's headquarters a kit of medicine for emergency relief, for disabled fire fighters and other laborers. This equipment should be placed under lock and the articles should be replaced as needed. A kit consisting of the following list of equipment placed in a durable metal box containing instructions for its use has been selected. Paragraph 9r of the Fiscal Regulations states that "purchase of medicines will be allowed only in the case of employees not occupying statutory positions, and then only when specifically authorized by the Secretary."

- 5 1-oz. Absorbent Lint, B. W.
- 1 Doz. 3-yd. packages pleated gauze, B. W.
- 1 1-yd. package Iodoform gauze, B. W.
- 6 2-oz. packages Absorbent Cotton, B. W.
- 2 Spools Zinc Oxide Adhesive Plaster, 1"x5'.
- 8 Plain Gauze Bandages, 2"x10'.
- 8 Unbleached Muslin Bandages, 2"x5'.
- 1 Jar Carbolated Petrolatum.

- 1 Tourniquet.
- 2 Papers Safety Pins.
- 1 Pr. Scissors.
- 1 Pr. Tweezers.
- 100 2-gr. Quinine Tablets.
- $\frac{1}{2}$  Pt. Bottle Peroxide.
- $\frac{1}{2}$  Pt. Bottle Turpentine (pure).
- 1 Small Scalpel Knife.
- 1 Medicated Soap, Squibbs  $\frac{1}{4}$  lb. Catgut.
- $\frac{1}{4}$  Doz. Suture Needles.
- Cathartic Comp. Improved.
- 1 Thermometer (Clinical).
- 1 Witch Hazel Salve.
- 1 Castile Soap (cake).
- 1 Spatula.
- 1 Artery Forceps (Pean's).
- 4 oz. Alcohol.
- Flaxseed Meal.
- Boracic Acid (Powdered).
- Epsom Salts.
- Mustard Plasters.
- Probe.
- 2 Spools thread (1 heavy, 1 light).

### FIRE FIGHTING ACCORDING TO CLASSES.

Class 1. *Neglected Camp or Other Small Fires Which Can Be Extinguished by Direct Attack (Covering from a few feet square to several rods).*

A neglected camp fire can be extinguished by water if it is convenient, or by smothering it with a few shovels of moist earth, after which all sticks and rubbish are raked away and a trench is dug entirely around the fire, as a precaution. The same methods can be applied to a small fire just started, but in either case be sure not to leave it until you know it is out. It is a good idea to scatter the coals and burning sticks before applying the earth.

Class 2. *Ground Fires Which Burn in Deep Humus, in Dense Timber or Old Decayed Logs, Which Usually Burn Slowly for Weeks and Sometimes Months, and Are Difficult to Entirely Extinguish.*



TABLE NO. 2.

Table of Cooking Equipment.

No. of Men	Water Bags, 2½ gal.	Water Bags, 5 gal.	Canvas Buckets	Knives, table	Forks, table	Teaspoons	Tablespoons	Spoons, stirring	Plates	Mush bowls	Cups	Milk Pans (dish ups)	Dish Pans	Fry Pans	Stew Kettles, ½ gal.	Meat Forks	Galv. water buc, et, 4 gallon	Wash Basins	Towels (cheap)	Dish Towels, ½ yd-4 Goods	Butcher Knives	Stew Pans	Can Opener	1-Quart Coffee Pot	2-Quart Coffee Pot	1-Gal. Coffee Pot	1½-Gal. Coffee Pot	2-Gal. Coffee Pot	D. B. Axes	7x9 Tents	10x14 Tents	14x14 Flies	Stoves	Reflectors	8-inch files	Meat saw	4-Gal. Stew Kettle	2-Gal. Stew Kettle	Slop Bucket	Lanterns	Total Weight
1	1			2	2	2	1		2		2			*2	1			1	2	2	1	1	1						1	1					1				1	45	
2	1			3	3	3	2		3		3		1	*2	2			1	2	2	1	2	1	1					1	1					1				1	46	
3	1			4	4	4	3	1	4	4	4		1	*2	2			1	3	3	1	2	7		1				1	1					1				1	47	
4	2			5	5	5	4	1	5	5	5	1	1	*3	2			1	4	4	1	2	1		1				1	2				1	1				1	60	
5	1	1	1	7	7	7	5	1	7	6	7	1	1	*3	2	1	1	1	5	4	2	2	1			1			1	2		1		1	1				1	120	
6	1	1	1	8	8	8	6	1	8	7	8	2	1	*3	3	1	1	1	6	5	2	2	1			1			1	1	1	1		1	1				1	150	
7	1	1	1	9	9	9	7	1	9	9	9	3	2	*4	3	1	1	1	7	6	2	3	1			1			1	1	1	1		1				2	160		
8	2	1	1	12	12	12	8	1	12	12	12	4	2	3	4	1	2	2	12	8	2	4	1				1		1	1	1	1	1		2				2	315	
9	2	2	1	12	12	12	9	2	12	12	12	4	2	4	4	1	2	2	12	12	2	4	1				1		1	1	1	1	1		2				2	320	
10	2	2	1	18	18	18	12	2	18	18	18	4	2	4	3	1	2	2	18	12	2	4	1					1	2	2	1	1	1		2	1			1	2	365
11	2	2	1	18	18	18	12	2	18	18	18	4	2	4	3	1	2	2	18	12	2	4	1					1	2	2	1	1	1		2	1		1	1	2	365
12	2	2	2	18	18	18	18	2	18	18	18	4	2	4	3	1	2	2	18	12	2	4	1					1	2	2	1	1	1		2	1	1	1	1	2	367
13	2	2	2	18	18	18	18	2	18	18	18	4	2	4	3	1	2	3	18	12	2	4	1					1	2	2	1	1	1		2	1	1	1	1	3	368
14	2	2	2	24	24	24	24	2	24	24	24	4	3	4	3	1	2	3	18	12	2	4	1				2		2	2	1	1	1		2	1	1	1	1	3	377
15	2	2	2	24	24	24	24	2	24	24	24	4	3	4	3	1	2	3	18	12	2	4	1				2		2	2	1	1	1		2	1	1	1	1	3	378
16	2	2	2	24	24	24	24	2	24	24	24	4	3	4	3	1	2	3	24	12	2	4	1					2	2	3	1	1	1		2	1	1	1	1	3	400
17	2	2	2	24	24	24	24	2	24	24	24	4	3	4	3	1	3	3	24	12	2	6	1					2	2	3	1	1	1		2	1	1	1	1	3	405
18	2	2	2	24	24	24	24	2	24	24	24	4	4	4	3	1	3	4	24	12	2	6	1					2	2	4	1	1	1		2	1	1	1	1	4	430
19	3	3	2	30	30	30	30	2	30	30	30	4	4	4	3	1	3	4	24	12	2	6	1					2	2	5	1	1	1		2	1	1	1	1	4	450
20	3	3	2	30	30	30	30	3	30	30	30	4	4	5	3	2	3	4	30	12	2	6	2					2	2	5	1	1	1		2	1	1	1	1	4	452
21	3	3	2	30	30	30	30	3	30	30	30	4	4	5	4	2	3	5	30	12	2	6	2					3	2	5	1	1	1		6	1	1	1	1	4	453
22	3	3	2	30	30	30	30	3	30	30	30	4	4	5	4	2	3	5	30	12	2	6	2					3	2	5	1	1	1		6	1	1	1	1	4	453
23	3	3	2	30	30	30	30	3	30	30	30	4	4	5	4	2	3	5	30	12	2	6	2					3	2	5	1	1	1		6	1	1	1	1	4	453
24	3	3	2	30	30	30	30	3	30	30	30	4	4	5	4	2	3	5	30	18	2	6	2					3	2	5	1	1	1		6	1	1	1	1	4	454
25	3	3	2	36	36	36	36	3	36	36	36	4	4	5	4	2	3	5	30	18	2	6	2					3	2	5	1	1	1		6	1	1	1	1	5	465
26	3	3	2	36	36	36	36	3	36	36	36	4	4	5	4	2	3	6	30	18	2	6	2					3	2	5	1	1	1		6	1	1	1	1	5	465
27	3	3	2	36	36	36	36	3	36	36	36	4	4	5	4	2	3	6	30	18	2	6	2					3	2	5	1	1	1		6	1	1	1	1	5	465
28	3	3	2	36	36	36	36	3	36	36	36	4	4	5	4	2	3	6	30	18	2	6	2					3	2	5	1	1	1		6	1	1	1	1	5	465
29	3	3	2	36	36	36	36	3	36	36	36	4	4	5	4	2	3	6	30	18	2	6	2					3	2	5	1	1	1		6	1	1	1	1	5	465
30	3	3	2	36	36	36	36	3	36	36	36	4	4	5	4	2	3	6	30	18	2	6	2					3	2	5	1	1	1		6	1	1	1	1	5	465

\*Small.  
Remainder large.



TABLE NO. 3.

(FOOD REQUIRED PER DAY FOR FROM 1 TO 30 MEN BY POUNDS)

No. of Men	Flour	Corn Meal	Breakfast Foods	Rice	Crackers	Potatoes	Sagar	Coffee	Butter	CuredMeats	Fresh Meat or Fish	Tea	Lard	Vegetables	Onions	Beans	Chocolate	Baking Powder	Soda	Salt	Macaroni	Cheese	Pepper	Cornstarch-Tapioca	Spices	Fruit (dried)	Meat(canned)	Vegetables (canned)	Tomatoes (canned)	Corn (canned)	Fruit (canned)	Milk (canned)	Pickles (canned)	Extract (Oz.)	Catsup (Bot.)	Soap Bars	Matches (Bxs.)	Lemons (Doz.)	Candles (Doz.)	Eggs (Doz.)	Coal Oil (Gal.)	Pancake Flour	Sago	Total Weight
1	1	.05	.10	.05	.05	.90	.40	.12	.10	.50	.25	.01	.15	.10	.10	.15	.02	.02	.01	.04	.02	.10	.01	.05	.05	.15	.05	.10	.10	.10	.15	.10	.03	.04	.02	.05	.01	.01	.05	.10	.01	.06	.02	5.50
2	2	.10	.20	.10	.10	1.80	.80	.24	.20	1.00	.50	.02	.30	.20	.20	.30	.04	.04	.02	.08	.04	.20	.02	.10	.10	.30	.10	.20	.20	.20	.30	.20	.06	.08	.04	.10	.02	.02	.10	.20	.02	.12	.04	11.00
3	3	.15	.30	.15	.15	2.70	1.20	.36	.30	1.50	.75	.03	.45	.30	.30	.45	.06	.06	.03	.12	.06	.30	.03	.15	.15	.45	.15	.30	.30	.30	.45	.30	.09	.12	.06	.15	.03	.03	.15	.30	.03	.18	.06	16.50
4	4	.20	.40	.20	.20	3.60	1.60	.48	.40	2.00	1.00	.04	.60	.40	.40	.60	.08	.08	.04	.16	.08	.40	.04	.20	.20	.60	.20	.40	.40	.40	.60	.40	.12	.16	.08	.20	.04	.04	.20	.40	.04	.24	.08	22.00
5	5	.25	.50	.25	.25	4.50	2.00	.60	.50	2.50	1.25	.05	.75	.50	.50	.75	.10	.10	.05	.20	.10	.50	.05	.25	.25	.75	.25	.50	.50	.50	.75	.50	.15	.20	.10	.25	.05	.05	.25	.50	.05	.30	.10	27.50
6	6	.30	.60	.30	.30	5.40	2.40	.72	.60	3.00	1.50	.06	.90	.60	.60	.90	.12	.12	.06	.24	.12	.60	.06	.30	.30	.90	.30	.60	.60	.60	.90	.60	.18	.24	.12	.30	.06	.06	.30	.60	.06	.36	.12	33.00
7	7	.35	.70	.35	.35	6.30	2.80	.84	.70	3.50	1.75	.07	1.05	.70	.70	1.05	.14	.14	.07	.28	.14	.70	.07	.35	.35	1.05	.35	.70	.70	.70	1.05	.70	.21	.28	.14	.35	.07	.07	.35	.70	.07	.42	.14	38.50
8	8	.40	.80	.40	.40	7.20	3.20	.96	.80	4.00	2.00	.08	1.20	.80	.80	1.20	.16	.16	.08	.32	.16	.80	.08	.40	.40	1.20	.40	.80	.80	.80	1.20	.80	.24	.32	.16	.40	.08	.08	.40	.80	.08	.48	.16	44.00
9	9	.45	.90	.45	.45	8.10	3.60	1.08	.90	4.50	2.25	.09	1.35	.90	.90	1.35	.18	.18	.09	.36	.18	.90	.09	.45	.45	1.35	.45	.90	.90	.90	1.35	.90	.27	.36	.18	.45	.09	.09	.45	.90	.09	.54	.18	49.50
10	10	.50	1.00	.50	.50	9.00	4.00	1.20	1.00	5.00	2.50	.10	1.50	1.00	1.00	1.50	.20	.20	.10	.40	.20	1.00	.10	.50	.50	1.50	.50	1.00	1.00	1.00	1.50	1.00	.30	.40	.20	.50	.10	.10	.50	1.00	.10	.60	.20	55.00
11	11	.55	1.10	.55	.55	9.90	4.40	1.32	1.10	5.50	2.75	.11	1.65	1.10	1.10	1.65	.22	.22	.11	.44	.22	1.10	.11	.55	.55	1.65	.55	1.10	1.10	1.10	1.65	1.10	.33	.44	.22	.55	.11	.11	.55	1.10	.11	.66	.22	60.50
12	12	.60	1.20	.60	.60	10.80	4.80	1.44	1.20	6.00	3.00	.12	1.80	1.20	1.20	1.80	.24	.24	.12	.48	.24	1.20	.12	.60	.60	1.80	.60	1.20	1.20	1.20	1.80	1.20	.36	.48	.24	.60	.12	.12	.60	1.20	.12	.72	.24	66.00
13	13	.65	1.30	.65	.65	11.70	5.20	1.56	1.30	6.50	3.25	.13	1.95	1.30	1.30	1.95	.26	.26	.13	.52	.26	1.30	.13	.65	.65	1.95	.65	1.30	1.30	1.30	1.95	1.30	.39	.52	.26	.65	.13	.13	.65	1.30	.13	.78	.26	71.50
14	14	.70	1.40	.70	.70	12.60	5.60	1.68	1.40	7.00	3.50	.14	2.10	1.40	1.40	2.10	.28	.28	.14	.56	.28	1.40	.14	.70	.70	2.10	.70	1.40	1.40	1.40	2.10	1.40	.42	.56	.28	.70	.14	.14	.70	1.40	.14	.84	.28	77.00
15	15	.75	1.50	.75	.75	13.50	6.00	1.80	1.50	7.50	3.75	.15	2.25	1.50	1.50	2.25	.30	.30	.15	.60	.30	1.50	.15	.75	.75	2.25	.75	1.50	1.50	1.50	2.25	1.50	.45	.60	.30	.75	.15	.15	.75	1.50	.15	.90	.30	82.50
16	16	.80	1.60	.80	.80	14.40	6.40	1.92	1.60	8.00	4.00	.16	2.40	1.60	1.60	2.40	.32	.32	.16	.64	.32	1.60	.16	.80	.80	2.40	.80	1.60	1.60	1.60	2.40	1.60	.48	.64	.32	.80	.16	.16	.80	1.60	.16	.96	.32	88.00
17	17	.85	1.70	.85	.85	15.30	6.80	2.04	1.70	8.50	4.25	.17	2.55	1.70	1.70	2.55	.34	.34	.17	.68	.34	1.70	.17	.85	.85	2.55	.85	1.70	1.70	1.70	2.55	1.70	.51	.68	.34	.85	.17	.17	.85	1.70	.17	1.02	.34	93.50
18	18	.90	1.80	.90	.90	16.20	7.20	2.16	1.80	9.00	4.50	.18	2.70	1.80	1.80	2.70	.36	.36	.18	.72	.36	1.80	.18	.90	.90	2.70	.90	1.80	1.80	1.80	2.70	1.80	.54	.72	.36	.90	.18	.18	.90	1.80	.18	1.08	.36	99.00
19	19	.95	1.90	.95	.95	17.10	7.60	2.28	1.90	9.50	4.75	.19	2.85	1.90	1.90	2.85	.38	.38	.19	.76	.38	1.90	.19	.95	.95	2.85	.95	1.90	1.90	1.90	2.85	1.90	.57	.76	.38	.95	.19	.19	.95	1.90	.19	1.14	.38	104.50
20	20	1.00	2.00	1.00	1.00	18.00	8.00	2.40	2.00	10.00	5.00	.20	3.00	2.00	2.00	3.00	.40	.40	.20	.80	.40	2.00	.20	1.00	1.00	3.00	1.00	2.00	2.00	2.00	3.00	2.00	.60	.80	.40	1.00	.20	.20	1.00	2.00	.20	1.20	.40	110.00
21	21	1.05	2.10	1.05	1.05	18.90	8.40	2.52	2.10	10.50	5.25	.21	3.15	2.10	2.10	3.15	.42	.42	.21	.84	.42	2.10	.21	1.05	1.05	3.15	1.05	2.10	2.10	2.10	3.15	2.10	.63	.84	.42	1.05	.21	.21	1.05	2.10	.21	1.26	.42	115.50
22	22	1.10	2.20	1.10	1.10	19.80	8.80	2.64	2.20	11.00	5.50	.22	3.30	2.20	2.20	3.30	.44	.44	.22	.88	.44	2.20	.22	1.10	1.10	3.30	1.10	2.20	2.20	2.20	3.30	2.20	.66	.88	.44	1.10	.22	.22	1.10	2.20	.22	1.32	.44	121.00
23	23	1.15	2.30	1.15	1.15	20.70	9.20	2.76	2.30	11.50	5.75	.23	3.45	2.30	2.30	3.45	.46	.46	.23	.92	.46	2.30	.23	1.15	1.15	3.45	1.15	2.30	2.30	2.30	3.45	2.30	.69	.92	.46	1.15	.23	.23	1.15	2.30	.23	1.38	.46	126.50
24	24	1.20	2.40	1.20	1.20	21.60	9.60	2.88	2.40	12.00	6.00	.24	3.60	2.40	2.40	3.60	.48	.48	.24	.96	.48	2.40	.24	1.20	1.20	3.60	1.20	2.40	2.40	2.40	3.60	2.40	.72	.96	.48	1.20	.24	.24	1.20	2.40	.24	1.44	.48	132.00
25	25	1.25	2.50	1.25	1.25	22.50	10.00	3.00	2.50	12.50	6.25	.25	3.75	2.50	2.50	3.75	.50	.50	.25	1.00	.50	2.50	.25	1.25	1.25	3.75	1.25	2.50	2.50	2.50	3.75	2.50	.75	1.00	.50	1.25	.25	.25	1.25	2.50	.25	1.50	.50	137.50
26	26	1.30	2.60	1.30	1.30	23.40	10.40	3.12	2.60	13.00	6.50	.26	3.90	2.60	2.60	3.90	.52	.52	.26	1.04	.52	2.60	.26	1.30	1.30	3.90	1.30	2.60	2.60	2.60	3.90	2.60	.78	1.04	.52	1.30	.26	.26	1.30	2.60	.26	1.56	.52	143.00
27	27	1.35	2.70	1.35	1.35	24.30	10.80	3.24	2.70	13.50	6.75	.27	4.05	2.70	2.70	4.05	.54	.54	.27	1.08	.54	2.70	.27	1.35	1.35	4.05	1.35	2.70	2.70	2.60	4.05	2.70	.81	1.08	.54	1.35	.27	.27	1.35	2.70	.27	1.62	.54	148.50
28	28	1.40	2.80	1.40	1.40	25.20	11.20	3.36	2.80	14.00	7.00	.28	4.20	2.80	2.80	4.20	.56	.56	.28	1.12	.56	2.80	.28	1.40	1.40	4.20	1.40	2.80	2.80	2.80	4.20	2.80	.84	1.12	.56	1.40	.28	.28	1.40	2.80	.28	1.68	.56	154.00
29	29	1.45	2.90	1.45	1.45	26.10	11.60	3.48	2.90	14.50	7.25	.29	4.35	2.90	2.90	4.35	.58	.58	.29	1.16	.58	2.90	.29	1.45	1.45	4.35	1.45	2.90	2.90	2.90	4.35	2.90	.87	1.16	.58	1.45	.29	.29	1.45	2.90	.29	1.74	.58	159.50
30	30	1.50	3.00	1.50	1.50	27.00	12.00	3.60	3.00	15.00	7.50	.30	4.50	3.00	3.00	4.50	.60	.60	.30	1.20	.60	3.00	.30	1.50	1.50	4.50	1.50	3.00	3.00	3.00	4.50	3.00	.90	1.20	.60	1.50	.30	.30	1.50	3.00	.30	1.80	.60	165.00



Deep trenching and careful watching furnish the only way to handle deep burning fires. Trenching should

**Deep Trenching—** be deep enough to reach mineral soil and at  
**Guarding.** least 16 inches wide. All roots and logs that are likely to carry fire across the trench must be removed. It will take careful patrol of trench lines to prevent underground roots from conducting fire across the lines. Sticks or other inflammable material must not be included in the mineral soil used for extinguishing fires.

Class 3. *Small, Slow-Burning Surface or Ground Fires Consuming Leaves, Grass and Other Scattering inflammable material, Covering an Area of ¼ Acre to 5 Acres, or More, Where Direct Attack May or May Not Be Advisable.*

Trenching and back-firing are usually the most effective means of suppressing ground fires, although trenching

**Trenching—** alone will sometimes do, where there is very little  
**Backfiring.** or no wind, and a small amount of rubbish on the ground. Again, fires may be attacked directly by whipping with fir boughs or gunny sacks. The whipping method is not safe, however, when there is much inflammable material on the ground.

The type of country in which this class of fires occurs may be divided into **steep, moderately steep, and moder-**

**Three Types** **ately level ground.** The presence of slide rocks  
**of Fire Zones.** and boulders materially influences the difficulty of fighting fire in either class.

## WHERE BACK-FIRING IS NOT NECESSARY.

In cases where a ground fire is being driven up a side hill to a barren apex or cliff, where it goes out itself, and

**Confining a** trenching below is necessary, judgment is required  
**Fire Within** in deciding where to attack. A trench on a steep  
**Trenches.** side hill is not likely to prevent live coals and burning coals from jumping across. A bench, if possible,

near the base of the hill, with a deep and moderately wide trench with the mineral earth thrown on the lower side where live coals and cones are liable to lodge, is best. Possibly the attack may begin at the bottom of a gulch below the fire and work up on both sides, especially if it is in yellow pine belts, to prevent the fire from crossing the dry gulch below and ascending the opposite slope. The side trenches must be so located that they work in the direction of the progress of the fire up the slope, do not angle away from the fire, but toward it, and gradually approach the apex at the summit.

Care must be taken with cones, logs, and rubbish immediately above the trench. The fire must be fought to the apex, upon both sides. Material must not be allowed to ignite and rill down the slope beyond the summit, or the work will be lost. The trench must be carried beyond slide rocks to prevent fire creeping through the line in debris among the rocks.

### WHERE BACK-FIRING IS RESORTED TO.

The direction of the prevailing wind must always be determined.

The **extreme head** of the fire is the basis, from which one must trench both ways. Back fires are then set  
**When** one must trench both ways. Back fires are then set  
**Back-Firing.** at any time when conditions are favorable and they can be held. Back-firing at any time is a task requiring sturdy judgment, if not experience. It is attended with more or less danger, and therefore a favorable time should be chosen when the wind will not drive the back fire across the trench.

The correct method of back-firing is to string a line of fires with a torch at the inner edge of the trench toward the  
**Method of** fire. These fires will gradually work together and  
**Setting** travel to the main fire. Extend the back-firing no  
**Back Fire.** further than it can be controlled absolutely. Patrol must be started immediately after starting the back fires, and increased as the back-firing line is extended, so that there will be no unprotected gaps.

To determine how far to go from a fire to begin trenching, one must first ascertain the size of the fire, calculate how  
**Judging** fast it is traveling, note the character and amount  
**Distance** of inflammable material on the ground, whether or  
**in Placing** not it is threatening valuable timber, calculate the  
**Trench.** amount of trench which can be made with the men at one's disposal, and then combine these estimates and figure out quickly where to start, in order to close in before the fire crosses the proposed line of defense route. Over untrenched ground, a margin for uncertainties must always be allowed. The margin may vary from ten feet to two hundred yards in this class of fire. It is extremely important to go far enough away to get the trenching and back-firing done ahead of the fire. If this is not done, the entire labor is likely to be lost. Of course, a great mistake can be made in going too far. The further one goes the more trenching one will have to do.



When the fire is upon level ground and even upon moderately steep slopes where rocks are not present a plow is very often a most efficient and rapid equipment for trenching. **Use of Plow.** preferably a strong breaking plow, or, even better, a road plow; at least four, or perhaps six horses should be used. Two men should hold the plow, especially where there are boulders, while one drives. Enough furrows must be made to complete a strip wide enough to entirely separate the areas of fire and debris, these to be followed up with shovels for finishing the trench.

As soon as the head of the fire is stopped and a gap broken through its advancing front, the "suction" or wind generated by the flames and heat will be broken. There will be left only fires driven by quarter winds, which travel more slowly and are much more easily controlled than a fire driven by a head wind. It usually takes from three to eight men to handle this class of fire under ordinary conditions. If the wind is blowing a gale, one will need more; and it is always better to have a slight excess of men than too few.

When the fire is under control, one man, or more, if necessary, is put in charge to patrol it for several days, or until it is absolutely safe. **Patrol Until Safe.** Any honest laborer will fight fire, but very few men will patrol successfully because the work appears unimportant. A soldier is trained to this work, but few laborers are naturally qualified for it, so a good man must be picked for the final work of guarding against a new outbreak.

*Class 4. A Very Hot and Rapid-Burning Fire Running in a Heavy Mass of Combustible Debris on the Ground in an Old Burn or Scattered Timber, With an Occasional Crown Fire of a Few Minutes' Duration, Where Direct Attack Is Impossible, Having a Fire Front of From  $\frac{1}{8}$  to 1 Mile.*

A forest fire that has reached the stage designated in Class 4 ordinarily has become an element of great danger, and **Element of Great Danger.** unless subdued immediately, may develop into a crown fire or a conflagration, by which life and property are imperilled. It should therefore be handled along similar lines of checking the advance of a hostile force by military methods such as organizing and rushing men and equipment to the front, establishing camps, commissary stations with freight wagons, pack trains, and a system of communication and signaling. The directing officer should establish his headquarters at the most central or advantageous camp, and if a telephone line does not run close to the camp, he should have it connected at the earliest possible moment with insulated copper wire in order to have constant communi-

cation with the Supervisor's office. If feasible, each camp should be connected with his headquarters, which will greatly expedite communication with his foremen. The portable test set should be freely used in this connection. Such a fire can be handled only by a man of large experience and executive ability.

Trenching and back-firing will probably be the most effective plan of attack, although there may arise various other emergencies where different methods can be adopted to good advantage such as dislodging and disposing of large logs and snags by dynamite.

### HOW TO DYNAMITE.

Sometimes it becomes necessary to use explosives in order to expedite trenching where the presence of roots, stumps, and rocks prevents the completion of fire trench within the necessary time by other means. Twenty per cent powder is efficient.

In order to shorten the distance to be blasted, a straight line of charges should be strung across the intervening space between trenches already completed, or between natural barriers. In order to get the best results possible, all blasts should be sprung at one time by electric current. The object is to loosen live stumps, boulders, roots and soil so that shovels can readily follow up and complete the trench. The handling of dynamite is so dangerous that no one should attempt to use it who has not had experience; therefore, when one is compelled to resort to its use, he should be sure to get some man who can use it with effect and without danger to the crew.

If no experienced men are listed in the catalogue of a district, and the use of dynamite is not fully understood, it is to be let alone. If there is an experienced man, he will be told what is to be accomplished on the ground and he will direct the work. The use of dynamite when understood is so effective that much money can be saved in work by its use besides the saving of time, which is so essential in fire fighting. Each ranger should study its use, so that it can be applied in improvement work as well as in fighting fires. The variance in soils and rocks is such that no set rule can be laid down unless the conditions of the country are known.

Ordinarily light trenching takes 1 stick of powder to the charge, 12 inches deep and set 3 to 5 feet apart along the line of trench, in light clay, or 20 inches deep, 4 to 6 feet apart, in volcanic ash. One and a half to two sticks properly placed will remove small stumps, while 10 to 20 sticks under the root of a large tree will throw it down when correctly placed. The more the powder is

#### **General Rules for Powder Work.**

confined, the greater its work. For setting single mines, caps and fuse should be used, in which case be careful of the caps. Never crimp them with the teeth—use a crimper. Never tamp the powder with metal—use a stick. Never place caps or powder close together in storing, or in a place where fire will reach either. Place them under a log in storing so that falling rocks or limbs will not discharge either the powder or the caps.

In scattering stands of yellow and lodgepole pine, the plow can be used to excellent advantage. Oftentimes, dynamite can be used in trenching through a mass of roots or disintegrated rocks.

**Construction of Wide Fire Breaks.** The system of trenching in Class 4 fires is the same as in Class 3, except it may be necessary to go further back from the main fire and, of course, it is conducted on a much more extensive scale.

A systematic organization is the most important factor in fighting a Class 4 fire. Camps of not more than thirty men to the camp should be established, under the supervision of an efficient foreman with a good cook and helper, supplemented by an organization of the men in squads of from 6 to 10, each squad to be under the direct charge of an efficient sub-foreman or "straw boss."

If there is a large crew it should be divided into shifts, so that the men will not have to work too long. Fire fighting is hard work and men must sleep. Men sleeping in the hot hours of the day should have shade and quiet. Rest is as essential as good food. Time is often saved by hiring a water boy to carry drinking water to the men. A wet sponge over the mouth and nose prevents that painful dryness from smoke which may sometimes permanently injure the laborer.

A foreman had better direct the efforts of his men than work at shoveling, and the Forest officer should alternate shifts with him so that both can have absolute rest at times. The present fire may not be the last fire of the season, and another fight may have to be directed at an early date. The Forest officer must take care of himself and not worry, because worry saps energy.

If the fire front is irregular, with points burning faster than the main fire, do not attempt to trench the contour of the fire, but cut across from point to point and save a vast amount of labor.

**Fire  
Contours.**



Avoid groups of snags when locating a trench. If snags can not be successfully trenched around to keep them from burning it will be necessary to fell them. If the fire is a bad one it may be well to fell all snags that are likely to fall across the trench or likely to furnish sparks which will blow across. Snags should be felled away from the trench, not along the side. Dropping of interior snags can usually best be accomplished at night or early morning in the cool when there is less smoke. Lanterns are always a necessity, and this fact must not be forgotten. It is often much easier to fight fire in the moonlight than in the hot afternoon sun. A cross-cut saw is more rapid than an ax for dropping large snags. One may think his fire is absolutely dead in the morning; but he must beware, and patrol all areas thoroughly during the day. A close watch of the condition of the fire line will enable the directing officer to strengthen weak points and take advantage of any strategic feature that new conditions may develop.

After a fire is under control, an efficient guard to patrol the fire lines should be established until the burned area is entirely safe to leave. Under ordinary conditions it will require from 15 to 75 men to suppress a Class 4 fire.

In many localities, the effect of grazing in reducing the fire hazard has been apparent. The presence of stockmen within the Forest is a direct protection in itself, while the action of trampling by stock, more especially by sheep, breaks up the litter and humus and mixes it with the soil, thus expediting the decay of the humus and aiding to retain moisture in the soil. A careful study of the average magnitude of fires shows that they diminish as the intensity of grazing increases. Also, instances have shown that the reduction of litter and grass by grazing actually prevents crown fires. It was shown that a crown fire was reduced to the type of a ground fire until it left a grazed area, when it again developed into a crown fire. Many fire breaks have been formed by driveways, and there have been specific instances where sheep were driven compactly in front of an advancing fire, which checked and actually extinguished it. Therefore, it is apparent that Forest officers may do well to study this phase of reducing the hazard by co-operation with stockmen along the lines of fire protection and prevention.

Class 5. *Crown Fires or Conflagration Where, on Account of Swiftness and Intensity of Heat, Human Efforts Must Have the Assistance of Natural Means Before Suppression Is Possible.*



Though fires of Class 5 are exceedingly rare, yet such a fire may have to be fought some time, because fires of this kind have occurred. Fires similar to the Fernie, B. C., fire of 1909, or the Coeur d'Alene fire of 1910, carry such imminent danger to human life that they must be checked even at exceedingly high cost and great risk.

The supervisor must take direct charge, summon his most efficient rangers to aid him, and call upon the District Forester for assistance.

In this class of fire, human welfare depends upon the most sagacious judgment of the Forest officers. Whole compartments may have to be sacrificed in order to retard the fire. Firebrands are liable to be carried by high winds for long distances—even for miles. Crews may be in deadly peril when communication and escape are cut off. Volunteer fire fighters should be called upon from outside points if needed. The greatest problem for the Forest officer to solve is that of providing supplies and transportation and selecting suitable, safe camps near strategic lines of attack. Arrangements should be made when a dry season approaches for the most rapid means of transportation available. Make such previous arrangements with railroad, automobile, and livery companies that rapid transportation will be guaranteed.

Experienced woodsmen and stockmen should be chosen as packers and to keep open the means of escape and communication, and also to act as relief squads to the refugees.

The main camp must be near water, and in such a location, if possible, that it is at the base of a slope inclining toward the fire, so that the camp can not be lost. This class of fire is influenced by two types of country very materially, mountainous or moderately level. In either case the line of attack must be placed far enough ahead so that the back fire can extend inward a mile or more before meeting the advance.

If upon moderately level land, greater distance should be necessary than where the progress of the fire is retarded by small canyons. The idea is that a crown fire will not extend much further than a half mile over country where the ground litter has been consumed, but in most forests the crown fire must be assisted by lower drafts of heat to advance. Therefore, if one goes far enough ahead he is bound to stop the fire.

Two parallel fire lines may have to be established in order to assure burning sufficient ground in advance of the conflagration in time to stop it and wide enough to prevent, under ordinary circumstances, fire brands being blown across the fire break.

It may be advisable to make a fire break by felling all timber in a strip of 100 feet or more wide after back-firing has taken place to stop the advance of the conflagration. If this is resorted to, a favorable place should be chosen for the break, such as on the crest of a ridge or close to a stream where there is the advantage of natural conditions as well. All trees should be felled toward the advancing fire.

Back-firing, while the most effective, is at the same time an extremely dangerous method of fighting fire. If not directed by men with cool heads and large experience, the fire situation may be greatly increased by the escape of back fires. Promiscuous back-firing is dangerous and should not be allowed.

In situations of this kind nothing can be accomplished without thorough organization, order, and discipline. No man who is not cool headed under extreme public excitement should be placed in charge of a squad of fire fighters, for the least demonstration of excitement by leaders may start a human stampede.

Should any member of a crew be cut off from escape, alarm should not be shown or the matter discussed with any one except members of the regular Forest force or some one in whom there is confidence.

Men must not be allowed to try to escape over unfamiliar, unburned ridges. Down stream is the best way, if possible, and it must always be remembered that the burned fire line offers a haven in which a cool trench can be dug and got into.

When a fire is stopped, the most trusted men are to be left in charge. All possible information will be secured regarding the injured, fire fighters will be let go, and expenses of the fire adjusted at once.

### COMMISSARY.

Next in importance to the fire crew itself is the commissary department. Care should be exercised in making out the supply lists in order that the maximum food values may be obtained in a given weight. The accompanying ration table should be studied in this connection.

SUPPLIES.

Umpqua.

Loading Station

Order No. 31

Total Weight 480 lbs.

Sent to

Loaded by

Kuhns

Holloway

National Forest

Big Camas

Date 8|5|11

No. horses 3

Flour .....	150 lbs.
Sugar .....	25 lbs.
Coffee .....	15 lbs.
Bacon .....	30 lbs.
Beef .....	50 lbs.
Potatoes .....	50 lbs.
Beans .....	25 lbs.
Milk—2 cases .....	100 lbs.
Prunes .....	10 lbs.
Cheese .....	10 lbs.
Macaroni .....	5 lbs.
Onions .....	10 lbs.

Total.....480 lbs.

After camp has been established the cook should see that the supplies are kept up. His provision lists should be checked by the officer in charge. The supplies sent on each order should be listed in duplicate. The original, which is to be signed by the packer, as a receipt, is left at the supply station. The carbon copy is given to the packer to be O. K.'d by the cook when the supplies are delivered. This copy is then turned over to the officer in charge of the camp. Both the original and duplicate are to be filed with the District Ranger at the earliest opportunity. The accompanying form offers a suggestion.

In addition to food there will be required supplies of tobacco, blankets, shoes, socks, etc. Supplies of this nature are absolutely necessary, but can not be paid for from Government funds and, since the men employed are usually without money or credit, the Forest officer should, if possible, make some arrangement for providing them. These items should be ordered in the same manner as the food supplies, but with the provision that anything not used or damaged can be returned. The bills should be sent to the supervisor's office, where they are charged to the officer ordering the supplies.

In this connection it should be stated that all bills relating to Government business should be O. K.'d by the officer incurring them. They should be plainly marked with the fire or project to which they are chargeable and should be promptly submitted to the supervisor.

### TIME.

The time of fire fighters should always be kept up to date, so that time slips may be submitted to the office promptly when a man quits or is discharged. With large crews it will be necessary to depend on the foremen for the time of the men employed under them. These records should be turned in to the officer in charge, every night if possible, and entered by him in the regular time book, Form 875. Instructions for the payment of fire fighters are given on the first page of this form.

As soon as a fire is under control all tools and other equipment not in use should be collected and cleaned, and a record made of all lost or broken articles. Fire-fighting equipment should be returned to the tool stations at the earliest opportunity. Unused provisions should be returned to the supply stations or utilized by improvement crews or other crews.

